1 is 79 fiber per mil years.

2 Q   I'm going to walk over to the board, Dr. Moolgavkar. I

3 just want to make sure that we've reflected the calculation for

4 Libby miners for lung cancer and the doubling-dose is reflected

5 here on the green circle at 278, is that correct?

6 A   That's correct.

7 Q   Okay. And the lung cancer doubling-dose for the mixed

8 fibers is represented here at the 100 level, is that right?

9 A   That's correct.

10 Q   And the 79 that's reflected here in blue, reflects --

11 relates to mesothelioma, is that correct?

12 A   That's correct.

13 Q   And that's the doubling-dose for mesothelioma chrysotile

14 fibers, is that right?

15 A   Yes.

16 Q   And going down to the 8.9 in the blue, that's the relative

17 -- the doubling-dose for Libby miners that you've estimated,

18 correct?

19 A   That's correct.

20 Q   And then finally the 3.2, that's also for mesothelioma and

21 that reflects the doubling-dose for mixed fibers, is that

22 right?

23 A   That is correct.

24 Q   I want to ask you about -- I think you've already talked

25 about this but I want to make sure the record is clear. With

1 respect -- what's the difference between the doubling-dose

2 calculations of 8.9 and 3.2 down here below the 15 as opposed

3 to the doubling-dose calculations that are up here on the

4 right-hand side of the chart, way above the 15?

5 A   Well, actually, there -- for mesothelioma there isn't any

6 difference because they're all based on Peto's formula.

7 There's no direct observation there. For lung cancer, of

8 course there's a difference because the doubling doses for lung

9 cancer are smack bang in the middle of the range of

10 observations and relative risk is directly observed and that's

11 what's modeled. So that's the difference.

12 Q   Let me see if I can get this right. I'm not sure I will.

13 But when you talk about the use of the Peto formula to derive

14 the doubling doses for mesothelioma and you say that's not in

15 the observed range, is that because you have to make inferences

16 below the observed range in the Peto model before you can

17 double the dose, is that correct?

18   MR. FINCH: Objection. Leading.

19   THE COURT: It is leading.

20 BY MS. HARDING:

21 Q   Could you explain why the doubling-dose for mesothelioma

22 is also a calculation that is not based on observed data but

23 even though the results for some of it are up here in the range

24 of what you called observed data?

25 A   Yes, and it's very simply because of one of the problems I

1 mentioned. Mesothelioma is a very rare disease and therefore,

2 relative risk cannot be directly estimated even in the

3 observable range. So one has to use a model to even -- and an

4 assumption regarding the background lifetime probability of

5 mesothelioma before one can make any -- before one can estimate

6 the doubling-dose.

7 Q   I have one further question. I want you to assume that

8 with respect to a particular asbestos fiber -- actually, I'll

9 step over here -- with respect to a particular asbestos fiber

10 exposure that you have information indicating that 99 percent

11 of the fibers are chrysotile and one percent of the fibers are

12 amphibole, what doubling-dose information for mesothelioma

13 would be appropriate to compare that asbestos exposure to?

14   MR. FINCH: Objection, Your Honor. This wasn't in

15 the Dr. Moolgavkar's report.

16   THE COURT: This is just a hypothetical at this point

17 I think to illustrate how to use the information I believe. So

18 it's proper. You may answer, doctor.

19 A   Well, if you said 99 percent chrysotile and one percent in

20 amphibole-like tremolite, I would say that would change the

21 doubling-dose from 79 to approximately 40.

22 Q   Okay. And what is that based on?

23 A   That's based on the fact that tremolite appears to be

24 about 100 times more potent than chrysotile in causing

25 mesothelioma.

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1 Q   Why does that, what you've just said, lead to the number

2 40 that you just answered?

3 A   Oh, because basically saying that you have 99 fibers of

4 chrysotile and one fiber of tremolite is like assuming you have

5 200 fibers of chrysotile so you have basically halved the

6 doubling-dose by increasing the potency.

7   MS. HARDING: Your Honor, could we take a five-minute

8 break so we could just discuss any other further questions

9 asked?

10   THE COURT: Yes.

11   MS. HARDING: Okay.

12   THE COURT: In fact, we'll take a ten-minute recess

13 and then reconvene.

14   (Recess)

15   THE COURT: Please be seated. Doctor, are you ready?

16   THE WITNESS: Yes.

17   MS. HARDING: Thank you, Your Honor.

18 BY MS. HARDING:

19 Q   Dr. Moolgavkar, I'm sorry, I have just a couple of more

20 questions and then just some housekeeping with respect to some

21 of your exhibits. The last thing I want to ask you relates

22 back to what we were just talking about, the doubling of doses

23 in the observed and unobserved brain in the use of models to

24 extrapolate at lower does.

25 A   Yes.

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1 Q   And I want to ask you about a statement from Hodgson and

2 Darnton which is one of the publications you've relied upon,

3 correct?

4 A   Yes.

5   MS. HARDING: Could I see the ELMO, please?

6   We're getting copies, Your Honor. We have copies. Q

7   This is the Hodgson and Darnton paper that you've

8 discussed today and relied upon?

9   THE COURT: I don't think it's on yet.

10 A   I don't see it.

11   Q   Oh, it's not on yet.

12   THE COURT: Mr. Finch said it's in the book.

13   MS. HARDING: Right, but Dr. Moolgavkar doesn't have

14 the book so --

15   THE COURT: Oh, I'm sorry.

16   MS. HARDING: May I approach the witness, Your Honor?

17   THE COURT: Sure.

18 Q   Dr. Moolgavkar, is this the Hodgson and Darnton study that

19 you've discussed today?

20 A   Yes, it is.

21 Q   Okay. I'd like you to turn to -- I have to locate it

22 here. I've lost my tab. You'll have to give me a second. I

23 apologize. There we go. Page 583 please. And I'd like to ask

24 you about the -- the first where I'm pointing, do you see where

25 I'm pointing, Dr. Moolgavkar?

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1 A   Yes.

2 Q   Okay. And this is a statement from Hodgson and Darnton

3 where they say that taking this evidence together, we do not

4 believe there is a good case for assuming any threshold for

5 mesothelioma risk, do you see that?

6 A   I see that, yes.

7 Q   Okay. And do you understand what Hodgson and Darnton

8 meant by that statement?

9 A   Yes, I believe I do.

10 Q   Would you explain that please?

11 A   I think that it is impossible to establish either the

12 existence or the non-existence of a threshold based on

13 epidemiological data. That is just a statistical fact and so

14 when Hodgson and Darnton say that arguments regarding

15 thresholds which I think they say someplace, are logical

16 nonsense, that is what they mean. It is not possible to assert

17 either the existence or the non-existence of a threshold based

18 simply on epidemiological data.

19 Q   Do any of the doubling-dose calculations that you've

20 performed in this case rely upon the existence of a threshold

21 for mesothelioma in calculating them?

22 A   No, they do not.

23 Q   Going down to the bottom of Page 583, this statement here

24 that says, "The second kind of uncertainty relates to the

25 question whether the relationship between exposure and outcome

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1 seen in the observed range continues to hold outside that

2 range. This kind of uncertainty cannot be quantified

3 statistically. Quantitatively, one can reasonably argue that

4 the agreement would be better for exposures close to the

5 observed range but with increasing distance from the observed

6 range, our confidence that we know what to expect decreases."

7 Is that a statement with which you agree or disagree?

8 A   Well, I agree with that statement completely. And, in

9 fact, I made it in my direct testimony when I said that the

10 further away you get from the observed range, the less certain

11 your results.

12 Q   Okay. I want to go back, Dr. Moolgavkar, just for what I

13 call housekeeping. We talked about certain exhibits that I'd

14 like to move into evidence as summaries of your opinions and

15 testimony and the data that you relied upon. Starting first

16 with 2244 -- GG-2244.

17 A   Yes.

18 Q   Is that an accurate summary of the average cumulative

19 exposures of asbestos exposed cohorts used to investigate risks

20 of lung cancer?

21 A   Yes, it is.

22   MS. HARDING: Okay, I move into evidence GG-2244,

23 Your Honor.

24   MR. FINCH: No objection.

25   THE COURT: It's admitted.

1   UNIDENTIFIED ATTORNEY: No objections, Your Honor.

2 BY MS. HARDING:

3 Q   Dr. Moolgavkar, looking at GG-2246, is that an accurate

4 summary of the average cumulative exposures of asbestos exposed

5 cohorts used to investigate risk of mesothelioma as you

6 testified to today?

7 A   Yes.

8   MS. HARDING: I move into evidence, Your Honor,

9 GG-2246.

10   MR. FINCH: No objection.

11   UNIDENTIFIED ATTORNEY: Same for the FCR.

12   THE COURT: It's admitted.

13 BY MS. HARDING:

14 Q   Looking at GG-2249, Dr. Moolgavkar --

15 A   Yes.

16 Q   -- is this an accurate depiction of the studies that you

17 relied upon in reaching your conclusion that low level asbestos

18 exposure in auto mechanics has not observed risk?

19 A   Well, these are the case control studies that I relied on,

20 yes.

21 Q   Is that an accurate summary, portrayal of the results of

22 the case control studies that you relied upon?

23 A   Yes.

24   UNIDENTIFIED ATTORNEY: Is there an objection?

25   MS. HARDING: Is there an objection?

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1   UNIDENTIFIED ATTORNEY: No objection.

2   MS. HARDING: Oh, I didn't offer it. I'm sorry. I

3 move into evidence, Your Honor, GG-2249.

4   MR. FINCH: No objection, Your Honor.

5   UNIDENTIFIED ATTORNEY: No objection.

6   THE COURT: It's admitted.

7 BY MS. HARDING:

8 Q   Dr. Moolgavkar, you also discussed the non-linear and

9 linear aspects of the Peto model in your testimony?

10 A   Yes.

11 Q   And is GG-2258 an accurate representation of the linear

12 and non-linear aspects of the Peto model as you've testified to

13 today?

14 A   Yes.

15   MS. HARDING: I move into evidence GG-2258.

16   MR. ANSPRO: Just to clarify, as calculated by this

17 witness. This represents your work.

18   THE WITNESS: Yes, it does.

19   MR. FINCH: No objection.

20   UNIDENTIFIED ATTORNEY: No objection.

21   THE COURT: It's admitted.

22 BY MS. HARDING:

23 Q   And finally, Dr. Moolgavkar, GG--2262 which is the board

24 that we've been discussing during your testimony today.

25 A   Yes.

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1 Q   Is that an accurate depiction of the cumulative exposure

2 estimates from important end points for asbestos exposure in

3 mesothelioma, cancer and asbestosis?

4 A   Yes.

5   MS. HARDING: I move into evidence GG-2262.

6   MR. FINCH: No objection.

7   UNIDENTIFIED ATTORNEY: As calculated and presented

8 in his report, this is his summary, correct?

9   THE WITNESS: Yes.

10   UNIDENTIFIED ATTORNEY: And no objection.

11   THE COURT: It's admitted.

12   MS. HARDING: Your Honor, I tender the witness. I'm

13 done.

14   THE COURT: Mr. --

15   MR. FINCH: Your Honor, may I have a minute to get

16 organized here?

17   THE COURT: Yes, sir.

18   (Pause)

19   MR. FINCH: Your Honor, may I approach the bench and

20 the witness?

21   THE COURT: Yes, sir.

22   CROSS EXAMINATION

23 BY MR. FINCH:

24 Q   Good morning again, Dr. Moolgavkar. Nathan Finch for the

25 Asbestos Claimant's Committee.

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1   A   Good morning.

2   Q   It's your opinion, is it not, that there are only two

3   causes of mesothelioma in the United States that have been

4   epidemiologically established, is that correct?

5   A   Yes.

6   Q   You believe that there's an epidemiological evidence

7   establishing that radiation causes mesothelioma?

8   A   Yes.

9   Q   And you also believe that, like the rest of the world,

10 that there is epidemiological evidence establishing that

11 asbestos exposure causes mesothelioma?

12 A   Yes.

13 Q   All right. I want to talk about the radiation exposure.

14 You have in front of you a book called <u>Dr. Moolgavkar Expert</u>

15 <u>Witness Reports</u>, do you see that?

16 A   Yes, I do.

17   MR. FINCH: And what I have done, Your Honor, is I

18 put -- he's had five reports in this case, and I put them in

19 the notebook behind the tab I think in chronological order,

20 although two of them are on the same date, Report 1, Report 2,

21 Report 3, Report 4 and Report 5.

22 Q   Could you turn in your book, Dr. Moolgavkar, to Report 2

23 at Page 10 and this is ACC-538. The bottom of the -- are you

24 there, Dr. Moolgavkar?

25 A   Yes, I am here.

1 Q   The bottom of the first paragraph, the carry-over

2 paragraph.

3 A   Yes.

4 Q   You write, "There is emerging evidence also that

5 mesothelioma can occur following radiation therapy for cancer,"

6 and you cite three medical articles, "Toward et al.", "Travis,

7 et al.", "Teta, et al."

8 A   Yes.

9 Q   My partner, Mr. Baylor, showed you each of those three

10 articles in your deposition, do you recall that?

11 A   Yes.

12 Q   And is it correct that none of those three articles have

13 any information about whether the subjects were exposed to

14 asbestos?

15 A   That is correct, but asbestos would not be expected to be

16 a confounder in these cases.

17 Q   Well, the article don't know whether or not the people

18 were exposed to asbestos, correct?

19 A   That is correct, but you need to adjust for potential

20 confounder, not for just any risk factor for disease when you

21 do these studies.

22 Q   Could you turn in your book to -- this is -- and there's

23 also a notebook that I've put in front of you, Dr. Moolgavkar,

24 cross examination articles. It's the second notebook I put up

25 there on the ledge.

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1 Q   Yes.

2   THE COURT: Doctor, if it helps, that tray pulls out.

3   THE WITNESS: Thank you.

4   THE COURT: Not a lot, but some.

5   THE WITNESS: But, the chair doesn't.

6   THE COURT: It doesn't move?

7 Q   Could you turn in that book to ACC/FCR-549?

8 A   Yes.

9 Q   This is the Teta article, correct?

10 A   Yes.

11 Q   Ms. Teta is one of your colleagues at Exponent?

12 A   That's correct.

13 Q   On Page 1436 of the article, underneath the table, the

14 authors write, "This finding was expected because mesothelioma

15 is a rare disease and it is estimated that greater than 85

16 percent of mesothelioma diagnoses are attributed to past

17 exposure to asbestos."

18 A   Yes.

19 Q   And they cite to a U.S. Government report, the Agency for

20 Toxic Substances and Disease Registry?

21 A   That's correct.

22 Q   And you don't dispute that over 85 percent of the

23 mesothelioma diagnoses in the United States are attributed to

24 asbestos exposure?

25 A   I do dispute that.

1 Q   Well, the -- they reported that here, correct?

2 A   They reported it, but I dispute it.

3 Q   So you dispute the Agency for Toxic Substances Disease

4 Registry's analysis that 85 percent of cases of mesothelioma in

5 the United States have been attributed to asbestos exposure?

6 A   Well, I dispute that figure, yes. I dispute their

7 analysis. I mean, I don't dispute a lot of things that ATSTR

8 has done, but that particular figure, I do dispute.

9 Q   Okay. Now, you've cited to The Institute of Medicine --

10 A   Yes.

11 Q   -- study on other cancers, correct?

12 A   That's correct.

13 Q   All right. I handed you a copy of the book called,

14 Asbestos Selected Cancers, right?

15 A   Yes.

16 Q   And this is put out by The Institute of Medicine in 2006?

17 A   Yes.

18   MR. FINCH: John, it's at ACC/FCR-2048.

19 Q   Could you turn to Page 83, sir?

20 A   Yes.

21 Q   The Institute of Medicine lists the risk factors for

22 development of malignant mesothelioma?

23 A   Yes.

24 Q   And they list as established exposure to asbestos fibers,

25 exposure to erionite fibers and exposure to talc or vermiculite

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1 contaminated with asbestos fibers, is that correct?

2 A   That's correct.

3 Q   Erionite fibers are only at issue in Turkey, right?

4 A   Yes.

5 Q   And they list as hypothesized but not established

6 radiation therapy, correct?

7 A   That's what they do, yes.

8 Q   And they cite to something called Sporn and Roggli,

9 correct?

10 A   Yes.

11 Q   Victor Roggli is one of the experts for the ACC and the

12 FCR in this case, is he not?

13 A   Yes, he is.

14 Q   The Institute of Medicine doesn't cite you with respect to

15 what is an established cause of mesothelioma, do they, sir?

16 A   Well, I haven't written an article on that.

17 Q   Now, one of the things you testified to on direct in

18 support of your opinion about the level of asbestos exposure

19 necessary to cause mesothelioma is studies relating to brake

20 workers, do you recall that testimony?

21 A   Yes.

22 Q   Could you turn in your book of Dr. Moolgavkar Reports to

23 Report 2 at Page 4, at the top.

24 A   Okay.

25 Q   There you have, some exposure studies suggest that brake

1 workers are exposed on average time weighted to .04 fiber

2 milliliters of chrysotile fibers greater than five microns in

3 length?

4 A   Yes.

5 Q   Then you have a footnote that says -- cites to a recent

6 paper by Findley that reports a medium cumulative exposure of

7 between 0.16 and 0.41 fiber milliliter years in the 1970s among

8 U.S. automobile mechanics involved in brake repair, correct?

9 A   Yes.

10 Q   So, the average exposure among brake mechanics in the

11 United States was somewhere between .16 and .41 fiber years

12 according to that article?

13 A   No, no, that's the median.

14 Q   That's the median.

15 A   Yes. That probably may not be the average at all. The

16 average could be much higher.

17 Q   The average could be lower, too, could it not?

18 A   It could be lower. You know, I'm in a strange bind here.

19 I'm not an industrial hygienist, and I'm simply reporting

20 numbers found in the literature. In the past I've been

21 criticized for reporting that brake workers were exposed to too

22 little asbestos and now it seems to me that the criticism is

23 coming from the other direction.

24 Q   In that same report, Report 2, Page 20, you cite to -- the

25 very bottom, to an article by Otto Wong, "Malignant

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1 Mesothelioma and Asbestos Exposure among Auto Mechanics."

2 A   Yes.

3 Q   I take it you've read that article?

4 A   Yes, I've read it.

5 Q   Okay. Could you turn in your book of Moolgavkar exhibits,

6 not your reports but the other book. But, for the rest of this

7 exam I'll call your report book, your report book and the other

8 book the exhibit book, can we agree on that?

9 A   Sure. Are you going to put it up?

10 Q   I'm going to show it up.

11 A   Okay.

12 Q   It's Exhibit ACC/2072. That's the Wong article, Dr.

13 Moolgavkar?

14 A   Yes, it is.

15 Q   Okay. Could you turn to Page 174 in that article?

16   THE COURT: Mr. Finch, if you just have it put up, I

17 think it'll save everybody time. We're all looking at it on

18 the screen.

19   MR. FINCH: Okay.

20 Q   The right-hand column, second paragraph, the author

21 writes, "Specificity in both exposures and disease in points is

22 one of the most criteria in causation assessment. If the

23 subject matter is exposure to asbestos from friction products

24 among auto mechanics we must base our evaluation on studies of

25 auto mechanics and not on other occupations. For example, it

1 is not valid to apply the results of studies of insulators, or

2 shipyard workers to auto mechanics because workers in these

3 vastly different occupations are exposed to different types of

4 asbestos as well as the different concentration levels of

5 asbestos. In the studies reviewed above, mesothelioma risk not

6 only of all garage mechanics, but also those specifically

7 engaged in brake repairs was assessed". Do you agree with

8 that?

9 A   Do I agree with what?

10 Q   That if the subject matter is exposure to asbestos from

11 friction products among auto mechanics, you should base your

12 evaluation on studies of auto mechanics not on other

13 occupations.

14 A   No, that's -- yes, that appears to be self-evident.

15 Q   Okay. Grace did not make brakes, correct?

16 A   Not to the best of my knowledge.

17 Q   Okay. In the next paragraph, Dr. Wong writes, "Exposure

18 response relationship is yet another important causation

19 criteria. Fiber measurement studies have indicated that garage

20 mechanics are exposed to extremely low levels of asbestos as a

21 result of the thermal transfer formation of asbestos fibers

22 during the braking process. The asbestos fibers in brake

23 linings are entirely chrysotile fibers in a bonded or

24 encapsulated state. During braking a temperature in excess of

25 700 to 800 degrees Celsius is reached and the chrysotile fibers

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1 break down into fosterite and anhydrous magnesium silicate,

2 which is non-fibrous." You see that?

3 A   Yes, I do.

4 Q   And you have testified previously, have you not, that the

5 asbestos fibers from brakes become a heat modified form of

6 asbestos?

7 A   Yes, I have.

8 Q   And, you've testified previously, have you not, that the

9 body reacts differently to a heat modified form of asbestos,

10 the body does know that it's a heat modified form of asbestos?

11 A   There is some limited evidence to suggest that the

12 biological potency of heat modified chrysotile is less than

13 that of regular chrysotile, yes.

14 Q   And the Grace products that contain asbestos are not

15 modified by heat in the mixing or the application process, are

16 they?

17 A   I have no idea how Grace products are used.

18 Q   And you haven't studied the fiber content of Grace

19 products to determine whether they're tremolite or chrysotile

20 or to the extent to which the Canadian commercially added

21 asbestos has tremolite in it?

22 A   That's correct.

23 Q   Tremolite is an amphibole?

24 A   Yes.

25 Q   And amphiboles are a hundred times more potent for causing

1 mesothelioma than chrysotile?

2 A   Yes.

3 Q   Now, in 1998 the World Health Organization put out a

4 monograph specifically related to chrysotile asbestos, did it

5 not?

6 A   Yes, I believe so.

7 Q   In the Redweld beside you, there are some exhibits that

8 are too fat to fit in either of the notebooks. Could you pull

9 out ACC/FCR-643?

10   THE COURT: Are you putting it up?

11   MR. FINCH: Yes. Unfortunately, my copy of this is

12 not page-numbered, so we may just have to --

13 Q   First of all, Dr. Moolgavkar, do you recognize this as

14 Environmental Health Criteria 203, chrysotile asbestos, put out

15 by the World Health Organization?

16 A   Yes, I've seen this some time ago. I haven't looked at it

17 recently.

18 Q   Okay. Could you turn to Section 1.6, it's about 12 pages

19 into the document?

20 A   May I wait for you to pull it up?

21 Q   May I move over here to show John where you are? The

22 World Health Organization stated that commercial grades of

23 chrysotile have been associated with an increased risk of

24 pneumoconiosis, lung cancer and mesothelioma in numerous

25 epidemiological studies of exposed workers. You don't dispute

1 that, do you?

2 A   No, I don't.

3   MR. FINCH: Could you go to the very bottom of

4 Section 1.6, John, right above Section 1.7.

5 Q   And the World Health Organization also determined, did it

6 not, that it should be recognized that although the

7 epidemiological studies of chrysotile exposed workers have been

8 primarily limited to the mining and milling and manufacturing

9 sector, there is evidence based on the historical pattern of

10 disease associated with exposure to mixed fiber types in

11 western countries, that the risks are likely to be greater

12 among workers in construction and possibly other user

13 industries. Did I read that right?

14 A   Yes, you did.

15   Q   And in Section 10 --

16   MR. FINCH: Okay. Can I have the ELMO?

17 Q   It may be faster for you to refer to Section 10 in the

18 --

19 A   Section?

20 Q   Section 10. Conclusions and recommendations for the

21 protection of human health. Isn't it correct that the World

22 Health Organization determined that exposure to chrysotile

23 asbestos poses increased risk for asbestosis, lung cancer and

24 mesothelioma in a (indiscernible - cough) manner, no threshold

25 has been identified for carcinogenic risks?

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1 A   Yes.

2 Q   And that's still the position of the World Health

3 Organization, correct?

4 A   Well, that's still my position, too. I don't think any

5 threshold has been demonstrated.

6 Q   So, you're not saying that an exposure below 15 fiber

7 years can't be attributed -- a mesothelioma with an exposure

8 below 15 fiber years cannot be attributed to asbestos?

9   MS. HARDING: I object to foundation. I think that

10 misstates his testimony with respect to attributed to asbestos.

11 You asked him about a threshold.

12 Q   You're not offering an opinion that if -- or are you, are

13 you offering an opinion that no asbestos exposure below 15

14 fiber years can cause mesothelioma?

15 A   I have not offered that opinion.

16 Q   Okay. And you're also not offering an opinion that no

17 asbestos exposure below 3.2 fiber years can cause mesothelioma,

18 are you?

19 A   I have not offered that opinion.

20 Q   And you're not offering the opinion that no asbestos

21 exposure below one fiber year can cause mesothelioma?

22 A   I have not offered that opinion.

23 Q   You haven't offered the opinion that no asbestos exposure

24 below 0.5 fiber years is insufficient to cause mesothelioma?

25 A   I concede that I do not recognize the existence or

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1 non-existence of a threshold.

2 Q   Okay. Now, would you agree that there is a debate between

3 medical practitioners concerning the extent to which chrysotile

4 asbestos can cause mesothelioma?

5 A   Well, I'm not sure that a debate among medical

6 practitioners is too relevant. If you ask me about a debate

7 among epidemiologists, yes, I think that is relevant.

8 Q   Well, there's also a debate among epidemiologists as to

9 whether chrysotile -- the difference -- whether chrysotile

10 causes mesothelioma.

11 A   Yes, there is still ongoing debate on that issue.

12 Q   You're familiar with Dr. William Nicholson, correct?

13 A   I'm familiar with his work, yes.

14 Q   Okay. He was -- he did some projections in 1982 of the

15 projected incidents of mesothelioma in the United States,

16 correct?

17 A   I believe it was projected mortality, but --

18 Q   Projected mortality from mesothelioma and lung cancer,

19 from asbestos causes?

20 A   Yes.

21 Q   And he also did the work for the EPA in 1986 in the risk

22 assessment document that you rely on in part, correct?

23 A   Yes. That's correct, yes.

24 Q   Okay. Could you turn to ACC/649 in your binder? This is

25 a paper published by Dr. Nicholson shortly before he died,

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1 correct?

2 A   It's a paper published by Dr. Nicholson, whether it was

3 published shortly before he died, I don't know.

4 Q   Okay. It was published in January of 2001. This is an

5 article you are familiar with, correct?

6 A   I have seen it, yes.

7 Q   Okay. And Dr. Nicholson looks at the insulator cohort

8 that he and Dr. Selikoff studied over many years and makes some

9 analysis of the time course of disease in that cohort, correct?

10 In this paper?

11 A   Well, I'd like to see what you're referring to, if I may.

12 Q   Sure. Page 60, "Analysis utilizing the time course of

13 mesothelioma risk."

14 A   I don't believe I have that paper in my folder, but I can

15 follow along on the ELMO.

16 Q   You don't have ACC Exhibit 649 in your folder? It would

17 be in the second notebook.

18 A   Oh, in the notebook.

19 Q   In the notebook. I'm sorry, Dr. Moolgavkar, it would be

20 in the second notebook.

21 A   Okay. I can follow along on the ELMO.

22 Q   Okay. Are you there?

23 A   Yes.

24 Q   Okay. At Pages 60 and 61, he describes the time course of

25 mesothelioma risk --

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1 A   Yes. That's --

2 Q   -- in his cohort?

3 A   Yes. He's basically using the Peto formula.

4 Q   Yes. And he notes on Page 61 that prior to 1937 the

5 insulator cohort was exposed only to chrysotile?

6 A   Yes.

7 Q   And from the incidents of disease in that cohort, he

8 concludes, does he not, that the -- and this is at the bottom

9 of Page 61, right-hand column -- "As can be seen, the time

10 course of mesothelioma risk is totally incompatible with an

11 exposure pattern that begins in the late 1930s. Indeed, the 95

12 percent confidence limits on three of the four data points do

13 not intercept the expected distribution for amosite exposure.

14 Barring unknown exposures to amphiboles prior to 1935, the data

15 presents strong evidence that chrysotile is a substantial,

16 indeed the dominate contributor to the mesothelioma risk

17 experienced by this group of insulation workers." That's his

18 conclusion correct?

19 A   That is correct.

20 Q   And Dr. Nicholson has published many articles relating to

21 mesothelioma and the risk of asbestos -- risk of mesothelioma

22 caused by asbestos in peer-reviewed medical journals, correct?

23 A   That's correct. Mr. Finch, one paper does not a debate

24 settle. There is still ongoing --

25   MR. FINCH: There's no question pending, Your Honor.

1   THE COURT: Okay.

2 Q   Would you turn in your exhibit binder to ACC/FCR-646.

3 This is a paper published in The British Journal of Industrial

4 Medicine in 1965 by Muriel Newhouse, Dr. Moolgavkar?

5 A   I see it.

6 Q   You're familiar with this paper?

7 A   Yes, I have seen this paper.

8 Q   And in this -- this was presented at a big conference in

9 the United States in 1965, correct?

10 A   I don't know where it was presented.

11 Q   Dr. Newhouse and Dr. Thompson found mesothelioma that they

12 attributed to asbestos to people whose only known exposure was

13 living within half a mile of an asbestos factory, correct?

14 A   Would you please point that section out to me on the ELMO?

15 Q   Sure.

16 A   I believe that's correct, but I'd like to see it.

17 Q   It's on Page 264; "Neighborhood Exposures of

18 Mesothelioma," the second column. "At the present site there

19 were eight patients of mesothelioma living within a half mile

20 radius of the factory." And the authors of this paper

21 concluded that just living in the neighborhood, that it was

22 that exposure that caused their mesothelioma, correct?

23 A   Well --

24   MS. HARDING: Nate, can you point to the language so

25 we can look for it, please?

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1 Q   Well, Dr. Moolgavkar, you've testified about this paper

2 previously, correct?

3 A   I've been asked about this paper, I've testified, yes.

4 Q   And you've testified, have you not --

5   MS. HARDING: I'm just -- I was just trying to find

6 where -- for my purposes where you were asking him a question

7 about, that's all.

8   MR. FINCH: I was asking the question about

9 neighborhood exposures on Pages 264, 265 and now I'm asking him

10 about his prior testimony about this paper.

11   MR. BERNICK: There's no language that said what he

12 said.

13 Q   Well, your interpretation of this study, Dr. Moolgavkar,

14 is that the authors concluded that the neighborhood exposure

15 contributed to the mesothelioma?

16 A   I'd have to look at the entire paper again. I mean, if

17 that is what I testified at the time, I probably believed that

18 at the time. I must have believed that at the time.

19 Q   Okay. Now, the IARC put out a monograph on the evaluation

20 of carcinogenic risks to humans dealing specifically with

21 asbestos in -- the most recent one is 1987, correct?

22 A   It put out a monograph, I believe it was 1987. I don't

23 know that for a fact.

24 Q   Okay. Could you look in your exhibit binder, at Exhibit

25 2034?

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1 A   Okay.

2 Q   And asbestos is classified as a Group 1 carcinogen by

3 IARC, is that correct?

4 A   I would classify it as a Group 1 carcinogen, as well.

5 Q   And could you explain to the Court what a Group 1

6 carcinogen is?

7 A   Known to cause cancer in humans.

8 Q   Okay. Could you turn to the fourth page under Section A

9 of Exhibit 2034? First of all, Dr. Moolgavkar, you recognize

10 Exhibit 2034 as the IARC statement on the carcinogenity of

11 asbestos?

12 A   I'm sorry, I don't understand the question.

13 Q   Do you recognize the document 2034 as The World Health

14 Organization International Agency for Research on Cancer, the

15 statement on the cancer risk of asbestos?

16 A   If that's what it says on the document, yes.

17 Q   Okay. Could you --

18   THE COURT: Isn't this 2024, pardon me.

19   MR. FINCH: 2034.

20   THE COURT: Okay, I'm sorry.

21   MR. FINCH: 2034.

22 Q   The IARC states in the second paragraph, "Environmental

23 exposure, either in the houses of asbestos workers, or in the

24 neighborhood of asbestos mines or factories, has been noted in

25 some of the cases..." and they cite to numerous references,

1 correct?

2 A   Yes.   I don't know how many of these are proper

3 epidemiological studies.   They do have references here.

4 Q   And they also state, "That it has been estimated that a

5 third of the mesotheliomas occurring in the United States may

6 be due to non-occupational exposure."   And they cite someone

7 named Interline for that proposition.

8 A   Yes.

9 Q   You don't have any -- strike that question.   You certainly

10 haven't done any kind of analysis here to determine what

11 percentage of mesotheliomas in the United States are due to

12 non-occupational exposures to asbestos, have you?

13 A   That's an extremely difficult analysis to do, and any

14 results must be taken with a pinch of salt.

15   MR. FINCH: May I have the ELMO, John?

16 Q   Dr. Moolgavkar, in your direct testimony you were asked

17 about a paper by Iwatsubo, et al.?

18 A   Yes.

19 Q   Okay.   This is -- could you turn in your book to

20 ACC/FCR-287?   It's in the exhibit binder.

21   MS. HARDING: I'm sorry, what number in the book?

22   MR. FINCH: 287.

23   MS. HARDING: Thank you.

24   MR. FINCH: John, can you put up 287?

25   (Pause)

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1   THE COURT: Mr. Finch?

2   Q   Are you ready, Dr. Moolgavkar?

3   A   Yes.

4   Q   All right.   This is the Iwatsubo paper you were referring

5   to, correct?

6   A   That's correct.

7   Q   And that was published in the <u>American Journal of</u>

8   <u>Epidemiology</u>, correct?

9   A   Also correct.

10 Q   And that's a peer-reviewed journal that is probably one of

11 the most prestigious journals in the world relating to

12 epidemiology, correct?

13 A   Well, yes, probably.

14 Q   Okay.   And what this study shows is that it's a case

15 control study where an expert panel of industrial hygienists

16 attempted to estimate the asbestos exposures of the cases and

17 the controls, correct?

18 A   "Attempted" is the right word here.

19 Q   And they used their knowledge of the industrial hygiene

20 literature and their knowledge of the jobs that the people were

21 working on to make those retrospective estimates, correct?

22 A   I believe so, yes.

23 Q   Okay.   And on Page 139 they calculated some relative risks

24 of asbestos exposure at different fiber years of exposure,

25 correct?   At the bottom of Page 139, under cumulative exposure.

1 A   Well, yes, they didn't actually compute these relative

2 risks at fiber per mil years of exposure. They computed these

3 relative risks at fiber per mil years of exposure within

4 quotation marks.

5 Q   I understand within quotation marks, and you have some

6 difficulties with that, but this is what the expert panel of

7 industrial hygienists estimated was the historical exposure of

8 this group of people, correct?

9 A   Yes, that's what they attempted to do.

10 Q   Okay. And for people who were exposed to asbestos at a

11 level intermittently, between half a fiber year and one fiber

12 year, there was four time the risk of getting mesothelioma with

13 a confidence interval of 1.9 to 9.7, correct -- excuse me --

14 1.7 to 9.7?

15 A   That's what it says here, yes.

16 Q   Okay. And for people with continuous exposure to asbestos

17 of between a half a fiber year and one fiber year, the relative

18 risk was 4.6, correct?

19 A   Yes.

20 Q   And would you turn to the previous page, bottom left-hand

21 paragraph? The authors of this study write, do they not, "As

22 recently stated in a International Agency for Research on

23 Cancer meeting on retrospective assessment of occupational

24 exposure and epidemiology, the validity of expert judgment

25 which relies upon both the knowledge and the experience of

1 industrial hygienists has rarely been evaluated. Indeed, when

2 no objective method of measuring exposure is available, their

3 judgment is most often considered the gold standard." You're

4 not an industrial -- do you agree with that?

5 A   I'm not in a position to agree or disagree. As you were

6 about to say, I'm not an industrial hygienist, but it's clear

7 that they admit in this paper that their exposure estimates

8 were extremely soft.

9 Q   Okay.

10 A   They used five industrial hygienists, I understand. I

11 don't see any report of how consistent the estimates were among

12 these five industrial hygienists. It may be there, but I

13 haven't found it.

14 Q   Okay.   They also state at Page 140, do they not, in the

15 second column, second full paragraph down, last sentence, "That

16 even in cohort studies, however, precise measurement of

17 exposure is difficult"?

18 A   Yeah, I believe it's a different problem, however, but I'm

19 not going to opine as an expert on that issue. The cohort

20 studies I referred to were considered good enough by the EPA,

21 by Nicholson, by Hodgson & Darnton and by Berman & Crump.

22 Q   Okay. Do you know if Nicholson and Selikoff had any

23 contemporaneous measurements of exposure at all for any of the

24 insulator population they studied?

25 A   No, I don't.

1 Q   Now, another paper you have criticized is -- back on the

2 Iwatsubo paper -- the French doctors and epidemiologists who

3 published this in The American Journal of Epidemiology don't

4 testify for plaintiffs in asbestos litigation, do they?

5 A   I have no idea whether they do or do not.

6   MS. HARDING: I object to foundation.

7   THE COURT: He's answered, he doesn't know.

8 Q   Would you turn in your book to ACC/FCR-422? This is the

9 Rodelsperger paper?

10 A   Yes.

11 Q   That was published in The American Journal of Industrial

12 Medicine?

13 A   Yes.

14 Q   It's another peer-reviewed medical journal?

15 A   Yes.

16 Q   And, again, they used expert base exposure index to

17 estimate asbestos exposure retrospectively?

18 A   Yes.

19 Q   Okay. Would you turn to Page 269, Table 7? And what this

20 paper reports is that for people who were exposed to between 0

21 and 0.15 fiber years of asbestos, they had a 7.9 times the risk

22 of dying from mesothelioma, in the cases as compared to the

23 controls, correct?

24 A   That's what it reports. Would you like me to explain my

25 problems with this paper or do you want me to simply answer yes

1 or no to your questions?

2 Q   You can explain your problems with it on redirect.

3 A   Okay.

4 Q   The paper also concludes that this doesn't provide

5 evidence that manmade vitreous fibers cause mesothelioma,

6 correct?

7 A   You'd have to point that out to me.

8 Q   Okay.

9 A   I've read the paper but some time ago.

10 Q   Page 273, left-hand column, top of the page. They write,

11 "Therefore, in agreement with other studies there is

12 insufficient evidence to establish a causal relationship

13 between the exposure to MMVF and mesothelioma."

14 A   Yes. Insufficient evidence.

15 Q   Okay. MMVF is manmade vitreous fibers, correct?

16 A   Yes.

17 Q   All right. And then at the bottom of that section they

18 say, "Yet as for chrysotile it cannot be excluded that these

19 fibers may have caused a tumor even if they are not present in

20 the lung tissue when it's diagnosed." You see that?

21 A   Yes.

22 Q   What they're saying is that the fibers of either

23 chrysotile or MMVF can start the cancer process and may not

24 persist in the body to be detected upon autopsy, correct?

25 A   Yes.

1 Q   Now, the conclusions at the very bottom, the authors write

2 -- last two sentences of the paper. "These results confirm the

3 distinct dose response relationship with the interview study,

4 even in an accumulative exposure below one fiber year. They

5 clearly support the outcome of the French mesothelioma case

6 control study." That's what they concluded, correct?

7 A   May I point out that Dr. Rodelsperger had previously

8 concluded that brake mechanics are not at any increased risk of

9 mesothelioma?

10 Q   He concluded that in 1993, this paper is in 2001, correct?

11 A   Yes.

12 Q   Now, just so we're clear, up to now all my questions have

13 been about asbestos and mesothelioma and until I say otherwise,

14 you should assume that all my questions are about mesothelioma

15 and not the other asbestos diseases. I think that's been clear

16 from the record and what I've done with you, but do you

17 understand that, have you understood my questions in that

18 context?

19 A   Yes.

20 Q   Could you turn in your notebook to ACC/FCR-289?

21 A   Yes.

22 Q   This is the Hodgson and Darnton paper on which you

23 partially rely for your opinions here?

24 A   Yes.

25 Q   Okay. The authors of this paper make some statements

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1 about the exposure and risk estimates, the exposure data that

2 they are relying upon in this, correct?

3 A   Yes.

4 Q   Could you turn to Page 567, under exposure specific risk

5 estimates? They write, "It is generally assumed that the most

6 reliable guide to dose specific risk is provided by exposure

7 analyses using estimates of individual exposure. This is

8 clearly the case when these individual exposure values can be

9 accurately determined. However, this assumption is very much

10 not the case in the studies in this review. Not only are there

11 inevitable problems of extrapolating earlier exposures on the

12 basis of more recent measurements, there are also problems of

13 converting the most usual historic measurements in terms of

14 particle counts to the more relevant measure of fiber counts.

15 Direct fiber counting only became generally used in the 1970s."

16 You see that?

17 A   Yes.

18 Q   And then on Page 597, they go through the cohorts

19 one-by-one in the right-hand column, fourth bullet down,

20 they've got the cohort of U.S. Canada insulators. You see

21 that?

22 A   Yes.

23 Q   That's the Nicholson Selikoff insulator cohort used in the

24 1986 EPA study, correct?

25 A   Yes.

1 Q   And they say here, "The basis for the mean exposure in the

2 U.S. Canadian insulator cohort drawn from previous reviews is

3 very uncertain. It is not based on averaging known or

4 estimated individual exposures. It is plausible that

5 conditions may not have changed greatly over the relevant

6 period." You see that?

7 A   Yes.

8   MS. HARDING: Nate, where are you reading from?

9   MR. FINCH: I was reading from Page 597.

10   MS. HARDING: Thanks.

11 Q   Could you turn to Page 573? This has a chart showing the

12 risk of lung cancer at various exposure cohorts. You see that?

13 A   Yes.

14 Q   And that shows a wide band around the risks, some of the

15 cohorts, the 95 percent confidence intervals range from well

16 over 10 fiber milliliter years down to .01 correct?

17 A   That is not correct.

18 Q   Well, do you know what the range of exposure is in each of

19 those cohorts?

20 A   Mr. Finch, I think you're misunderstanding this figure

21 here. It seems to me the Y axis is R Sub-L. It's a measure of

22 risk.

23 Q   Relative risk of lung cancer.

24 A   It's not -- okay. It's the relative excess risk that they

25 look at, but so, I think you misstated that question. It's --

1 Q   Okay. Then I'll withdraw the question. You would agree

2 with me that each of the populations studied have a range of

3 exposures within them, correct?

4 A   Yes.

5 Q   And some of the ranges are well below -- the low end of

6 some of those ranges is well below 15 fiber years?

7 A   That's correct.

8 Q   And at Page 583, top of the right-hand column, the authors

9 write, talking about all of the observations, "All these

10 observations suggest that the relatively brief exposures may

11 carry a low, but non-zero risk of causing mesothelioma." You

12 agree with that?

13 A   I can see that, yes.

14 Q   Do you agree with that?

15 A   I don't have enough evidence to support that statement.

16 Q   Okay. You don't agree with it, and you don't disagree

17 with it?

18 A   Right.

19 Q   Okay. On Page 584, they state that, in the left-hand

20 column, "A lifetime risk of one in a hundred thousand

21 corresponds to an annual risk well below one in a million which

22 HSC has suggested as a guideline for the boundary between the

23 broadly acceptable and tolerable regions of fatal risk to an

24 individual." You see that?

25 A   Yes.

1 Q   And so what the HSC is, is the British government, right?

2 A   I assume so, yes.

3 Q   And what they're saying is that that's sort of the

4 boundary between what's an acceptable risk and what is not an

5 acceptable risk for exposures for death, correct?

6 A   Well, that's their opinion regarding acceptable risks,

7 yes.

8 Q   Okay. And then on Page 585, there's a table for

9 mesothelioma and lung cancer risk, or risk summaries for

10 cumulative exposure of one fiber years?

11 A   Yes, I see that.

12 Q   And for amosite, the best estimate is about 90 deaths per

13 100,000 exposed?

14 A   Yes.

15 Q   That's 90 times what the HSC describes as an acceptable

16 boundary?

17   MS. HARDING: Your Honor, I object to the relevance

18 of the regulatory standard in Britain for acceptable risk.

19   THE COURT: Do we have any cases in Britain?

20   MR. FINCH: I'll move on, Your Honor.

21 Q   The 90 deaths per 100,000 exposed is far in -- strike

22 that. You are familiar with Dr. Nicholson's 1982 paper on the

23 projected population at risk for mesothelioma and lung cancer?

24 A   Yes, I am.

25 Q   Okay. In the Redweld, Dr. Moolgavkar, there is a, I

1 believe, a copy of that paper which has been marked

2 ACC/FCR Exhibit Number 1.

3 A   Yes, I have that.

4 Q   Okay. And in this paper, Dr. Nicholson, at Page 287 has,

5 "The risk of asbestos cancer relative to insulation work after

6 25 years of exposure"? See that?

7 A   Yes.

8 Q   Okay. And so, for insulation work, that's the reference

9 population, that's the population as to which Dr. Nicholson has

10 estimates of exposure, correct?

11 A   That's correct.

12 Q   Okay. And on the previous page he estimates that the

13 insulator exposure at an estimated fiber concentration of 15

14 while they're working, times however long they're working, and

15 that's based on some work he did in 1981. You see that on

16 Table 15?

17 A   Yes.

18 Q   Okay. Then for the next page, 287, for construction

19 trades, except insulators, he doesn't have any estimates of

20 exposure for construction trades, correct?

21 A   That's correct.

22 Q   He doesn't rely on any -- even though he may have

23 mentioned some exposure data related to construction workers,

24 he doesn't rely on that exposure data in the paper in

25 estimating the relative risk of mesothelioma, correct?

1 A   That's correct.

2 Q   What, instead, he relies on is the number of mesothelioma

3 cases comparing the construction trades to the general

4 population as compared to the insulators?

5 A   Yes.

6   MR. FINCH: Your Honor, may I inquire about your

7 plans for lunch? I have a substantial additional amount to do.

8 Probably at least another hour.

9   THE COURT: How long are you going to -- who is cross

10 examining for the FCR?

11   MR. ANSBORO: I am, Your Honor.

12   THE COURT: How long are you going to be?

13   MR. ANSBORO: I would estimate 30 minutes at the

14 most.

15   THE COURT: And redirect?

16   MS. HARDING: Fifteen to 30 minutes, Your Honor,

17 depending on --

18   THE COURT: All right. So, about two hours.

19   MR. FINCH: This is a good topical -- this is a good

20 stopping point because I'm moving to a new topic. I can

21 continue, but I don't know if the witness would like a break

22 now or not.

23   THE COURT: Well, this is probably a good place to

24 break. Why don't we take a recess.   Can you all get down and

25 back in 45 minutes, or is that impossible in this building,

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1 it's tough, I know, with the elevators. No?

2   MR. FINCH: An hour would probably be better.

3   THE COURT: An hour? All right. We'll recess for

4 one hour. We'll reconvene at 1:20.

5   MR. FINCH: Thank you, Your Honor.

6   MS. HARDING: Thank you, Your Honor.

7   (Luncheon recess)

8   THE COURT: Would you be seated? Dr. Moolgavkar.

9 You're still under oath, doctor.

10   THE WITNESS: Yes, ma'am.

11   THE COURT: Mr. Finch.

12   (Pause - adjusting microphones)

13   THE COURT: Okay, Mr. Finch, go ahead while they're

14 working through this.

15   CONTINUED CROSS EXAMINATION

16 BY MR. FINCH:

17   Q   Nathan Finch for the Asbestos Claimants Committee.

18 Good afternoon, Dr. Moolgavkar.

19 A   Good afternoon.

20   MR. FINCH: Just for the record, I didn't hear or

21 have anyone tell me anything that Mr. Bernick may have said in

22 the microphones. I don't have any knowledge of what he would

23 have said to Ms. Harding.

24   MR. BERNICK: I was being facetious.

25 Q   Dr. Moolgavkar, do you still have the books of exhibits in

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Moolgavkar - Cross/Finch   115

1 front of you, your expert witness reports and the other book

2 called ACC/FCR exhibits?

3 A   Yes.

4 Q   Would you turn to what has been previously marked in this

5 case as ACC/FCR-398?

6 A   Yes.

7 Q   And, again, unless I tell you otherwise, my questions are

8 going to focus on mesothelioma, okay, Dr. Moolgavkar?

9 A   Yes.

10 Q   You recognize ACC-398 as the summary document that are

11 sometimes called the Helsinki criteria for the asbestos,

12 asbestosis and cancer, the Helsinki criteria for diagnosis and

13 attribution?

14 A   Yes.

15 Q   And this summary document is actually the cover document

16 to a much larger document which has many, many citations to the

17 peer-reviewed literature, correct?

18 A   Yes.

19 Q   And this was an invited conference in 1997 on experts

20 related to asbestos disease from multiple disciplines, correct?

21 A   Yes.

22 Q   They had epidemiologists, correct?

23 A   Well, I'd have to look at the list of invitees before I

24 comment on that.

25 Q   Okay. They had pathologists?

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1 A   Yes. That is correct.

2 Q   They had -- John Dement was one of the invitees, correct?

3 A   I don't have the list in front of me.

4 Q   If you turn to the last page, 316, the list of

5 participants begins on Page 315 and carries over to 316.

6 A   Yes, I see John Dement.

7 Q   He's an epidemiologist that did some of the studies, or at

8 least one of the studies that was included in the Hodgson and

9 Darnton?

10 A   The South Carolina cohort, yes.

11 Q   It includes Gunnar Hillerdal from Sweden?

12 A   Yes.

13 Q   It includes Klaus Rodelsperger, whose paper we just looked

14 at today?

15 A   Yes.

16 Q   It includes a Jonathan Parker?

17 A   I don't know him.

18 Q   Victor Roggli, you know Dr. Roggli?

19 A   He's not an epidemiologist.

20 Q   I know he's not an epidemiologist, he's a pathologist,

21 correct?

22 A   Yes.

23 Q   And Dr. Parker is an occupational medicine doctor,

24 correct?

25 A   I don't know him.

1 Q   Could you turn to Page 313?

2 A   Yes.

3 Q   Under mesothelioma. The authors of the Helsinki criteria

4 write, "A lung fiber count exceeding the background range for

5 the laboratory in question or the presence of radiographic or

6 pathological evidence of asbestos-related tissue injury, e.g.,

7 asbestosis or pleuroplax, or histopatologic evidence of

8 abnormal asbestos content, e.g., asbestos bodies in the

9 histologic sections of the lung should be sufficient to relate

10 a case of pleuro-mesothelioma to asbestos exposure on a

11 probability basis." Do you agree with that, or disagree with

12 that?

13 A   Oh, I disagree with that, totally.

14 Q   Okay. "In the absence of such markers a history of

15 significant occupational domestic or environmental exposure to

16 asbestos will suffice for attribution". Do you agree with that

17 or disagree with that?

18 A   You're still talking about mesothelioma here, right?

19 Q   Mesothelioma.

20 A   No, I disagree.

21 Q   Okay. The bullet points below that, "The great majority

22 of mesotheliomas are due to asbestos exposure." Do you agree

23 with that, or disagree with that?

24 A   Well, I think it depends on whether you're talking about

25 men or women. It depends on whether you're talking about

1 pleuro-mesothelioma or peritoneal mesothelioma. I have to

2 disagree with that statement the way it is made here.

3 Q   What about the statement about 80 percent of mesothelioma

4 patients have had some occupational exposure to asbestos and,

5 therefore, a careful occupational and environmental history

6 should be taken?

7 A   I have no way to check the veracity of that first

8 statement, which is a fact in quotes, but that a careful

9 occupational and environmental history should be taken, that

10 certainly -- I would agree with that.

11 Q   Okay. What about the bullet point an occupational history

12 of brief or low level exposure should be considered sufficient

13 for mesothelioma to be designated as occupationally related?

14 A   I disagree.

15 Q   You disagree with that. Were you aware that Dr. John

16 Parker is one of the experts for W.R. Grace in this case?

17 A   I told you I don't know Mr. John Parker.

18 Q   Okay. So, if he testified that in his view a vanishingly

19 trivially small exposure to asbestos could cause mesothelioma,

20 I take it you would disagree with him, too?

21 A   Yes, I would.

22 Q   Sticking with the Helsinki criteria, Page 314. And this

23 is the only set of questions I'm going to ask you about lung

24 cancer for right now. The Helsinki criteria also have

25 diagnostic criteria for lung cancer as well as mesothelioma,

1 correct?

2 A   Diagnostic criteria?

3 Q   Diagnostic and -- excuse me, attribution criteria.

4 A   Okay. Yes.

5 Q   At the bottom of Page 314, left-hand column, they write,

6 "For example, relative risk is roughly double for cohorts

7 exposed to asbestos fiber at a cumulative exposure of 25 fiber

8 years, are within equivalent occupational history, at which

9 level asbestosis may or may not be present or detectable." Do

10 you agree with that or disagree with that?

11 A   That's a compound statement. I actually -- I'd like to

12 take that apart.

13 Q   Okay. Let me ask it in two different questions. Do you

14 agree that relative risk is roughly doubled -- of lung cancer

15 is roughly double for cohorts exposed to asbestos fiber at a

16 cumulatively exposure level of 25 fiber years?

17 A   No, I don't agree. I showed you my estimates of doubling

18 doses earlier.

19 Q   You show your calculations of doubling-dose?

20 A   Yes.

21 Q   And according to the 20 authors of the Helsinki criteria,

22 25 fiber years is sufficient to double the risk of lung cancer,

23 correct?

24 A   Mr. Finch, you keep on showing me papers from 1965,

25 Newhouse and Thompson, the early 1980s, 1997. Why don't we

1 talk about the contemporary literature? This Helsinki criteria

2 document was produced before Hodgson and Darnton and before

3 Berman and Crump, 2003. So, let's keep at least the sequence

4 of events clear.

5 Q   It's correct, is it not, that Berman and Crump hasn't been

6 adopted as the official position of any governmental agency,

7 correct?

8 A   That is correct, but it is also true that it has undergone

9 pretty tough peer review.

10 Q   The Helsinki criteria -- let me back up. The Helsinki

11 criteria, as far as you know, have not been repudiated by the

12 authors.

13 A   No. The authors reached consensus, but I'm afraid that

14 the obtaining of consensus depends very much on who is invited

15 to these meetings.

16 Q   We've been talking about the medical literature and now I

17 want to focus you in on your calculations of the doubling-dose

18 for mesothelioma. We're back to mesothelioma questions.

19 A   Okay.

20   MR. FINCH: Okay. Can I have the slide show?

21 Q   You recognize that as Dr. Peto's formula for mesothelioma

22 risk, correct?

23   THE COURT: What exhibit is this, please?

24   MR. FINCH: It's not an exhibit, it's just on the --

25 it's just a demonstrative, Your Honor. I could mark it as an

1 exhibit.

2   THE COURT: Well, I thought he had one that was an

3 exhibit. I guess it was similar but not the same. It's just

4 going to be difficult to refer to anything later, if you need

5 me to look at something if I don't have a copy of it somewhere.

6   MR. FINCH: I can mark it for demonstrative purposes

7 at the end, if that would --

8   THE COURT: That would be helpful, please.

9   MR. FINCH: Okay, but for time being --

10   UNIDENTIFIED SPEAKER: Your Honor, if I could make a

11 suggestion. Why don't we just give it a number now, otherwise

12 --

13   THE COURT: Yes, we will give it a number now and get

14 a copy of it later.

15   MR. FINCH: Okay.

16   THE COURT: So, if you could --

17   MR. FINCH: Okay, let's -- what's the next in the

18 series, Dave? All right. This will be for purposes of

19 identification Exhibit 2086.

20   THE COURT: All right.

21   MR. FINCH: ACC-2086.

22   THE COURT: Thank you.

23 Q   All right. Just so we know where this comes from, Dr.

24 Moolgavkar, you have in your second report, at Page 7, you set

25 forth the formula developed by Dr. Peto, correct?

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1 A   Right.

2 Q   Okay. And what I've shown on this slide here is that

3 formula which shows the Peto formula for mesothelioma risk,

4 correct?

5 A   Yes.

6 Q   Okay. And the various variables, RM is the mortality rate

7 for mesothelioma, the F is the exposure concentration in fiber

8 milliliters, correct?

9 A   Yes.

10 Q   T is the years after the start of exposure, correct?

11 A   Yes.

12 Q   D is the duration of exposure, correct?

13 A   Yes.

14 Q   And, KM is an asbestos fiber potency factor, correct?

15 A   Correct.

16 Q   And this formula is the formula that was used in the 1986

17 EPA risk assessment paper, correct?

18 A   Yeah, the Nicholson paper.

19 Q   And you regard it as a scientifically valid way to

20 estimate mesothelioma risk.

21 A   Yes.

22 Q   Okay. Now --

23 A   I mean, it's one accepted mathematical formula for

24 mesothelioma risk.

25 Q   Okay. And the other is the Hodgson and Darnton?

Moolgavkar - Cross/Finch   123

1 A   Yes.

2 Q   All right. Now, the next slide. Now, what that formula

3 tells you is the probability that any particular time to

4 compute the total probability of mesothelioma, the risk has to

5 be summed over the number of years in which you're interested,

6 correct?

7 A   Right.

8 Q   And so, to calculate a lifetime risk of mesothelioma, the

9 equation is integrated between the limits of time, T, between

10 10 and 55 correct?

11 A   Yes.

12 Q   And integration is just a -- it's been a long time since

13 I've had calculus, but could you describe for the Court what

14 integration is?

15 A   Well, it's just a way of summing up over small intervals.

16 Q   It's a way of summing up the areas under a curve?

17 A   Right.

18 Q   Okay. And, then you set, in your calculations, you set T

19 at 45 because that's the interval between 10 and 55, correct?

20 A   That's correct.

21 Q   Okay. And then to find the doubling-dose, what you did is

22 you set the lifetime risk of meso, you call that P, to twice

23 the background rate of mesothelioma, so P equals two times

24 background rate times 45 to the fourth, times of potency

25 factor, times the fibers divided by four, correct?

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Moolgavkar - Cross/Finch   124

1 A   Well, it should not be the background rate of

2 mesothelioma, it should be the lifetime probability of

3 spontaneous mesothelioma.

4 Q   Okay. The lifetime probability. For purposes of this set

5 of slides, if we could say BGR equals lifetime probability for

6 mesothelioma?

7 A   Yes.

8 Q   Okay. And so, if you want to figure out what the

9 doubling-dose is, you have to solve that equation for the fiber

10 -- concentration, F, correct?

11 A   That's correct.

12 Q   And that's what you did in your calculations, the results

13 of which are shown at the back of your second report?

14 A   Correct.

15 Q   Okay. So, doing the math here, if you've got P equals 2

16 times BGR, which is actually the lifetime probability of

17 mesothelioma, you multiply a four on each side that gets you to

18 four times two, times BGR equals 45 to the fourth, times the

19 potency factor times the fiber, correct?

20 A   Yeah, fiber concentration.

21 Q   Okay. And then to solve for the fiber concentration all

22 you do is you take the four times the two, times the background

23 rate and divide it by 45 to the fourth, times the potency

24 factor, correct?

25 A   Yes.

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1   THE COURT: I hope nobody is going to expect anybody

2 to make any sense out of this record when they read it. You

3 better have the exhibits available.

4   MR. FINCH: I will offer the demonstrative for Your

5 Honor.

6   THE COURT: All right.

7 Q   The -- so since you wanted to find the doubling-dose for

8 cumulative exposure, you set the cumulative exposure to 45

9 years, and that results in a doubling-dose formula of four

10 times two times the lifetime probability of mesothelioma

11 divided by 45 cubed, times the potency factor, is that correct?

12 A   The -- would you go back to the previous one?

13   (Pause)

14 A   Yes, okay. That's correct.

15 Q   Okay. So the formula for the doubling-dose is a

16 mathematical formula, which is four times two times the

17 lifetime rate -- background rate of meso, divided by 45 cubed

18 time the potency factor, right?

19 A   Yeah.

20   THE COURT: Except it's not the background rate.

21 It's the lifetime probability of spontaneous meso.

22   Q   Yes, it's the lifetime probability of -- your

23 calculation of the lifetime probability of spontaneous

24 mesothelioma.

25   MS. HARDING: Object to form. It lacks foundation.

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1 You said it was your calculation of the lifetime --

2   MR. FINCH: Okay.

3 Q   Dr. Moolgavkar, the BGR is not background rate of

4 mesothelioma, it's the -- it is an input that you derive from

5 Price and Ware, correct?

6 A   That's correct.

7 Q   And it's the lifetime -- the estimated lifetime risk of

8 developing mesothelioma from spontaneous causes, correct?

9 A   That's correct.

10 Q   All right. And then this is how you reach your

11 doubling-dose of 3.2 fiber years for mesothelioma, correct?

12 A   Yes.

13 Q   Okay. Now, if there is a -- would you agree with me that

14 if the lifetime rate is 3.6 times ten to the minus four is

15 approximately equivalent to four cases per million people per

16 year, that if you cut the number of cases per million people

17 per year in half that the lifetime rate would approximately be

18 cut in half, as well?

19 A   Well, I think you're confusing two different concepts

20 here. I don't know where you got this figure, four per million

21 per year is equivalent to 3.6 times ten to the minus four

22 lifetime probability. I don't know where that came from.

23 Q   Okay. You have relied in coming up with the background

24 rate --

25 A   Okay, maybe I can help you here. You can't take that age

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1 adjusted rate in Price and Ware and convert that directly to a

2 lifetime probability. So maybe we can avoid this whole

3 sequence of questions.

4 Q   Okay. Let me take the Price and Ware article. Could you

5 turn in your book to ACC/FCR-560? Do you recognize that as the

6 Price and Ware article from which you derive your lifetime

7 background risk for mesothelioma?

8 A   Yes, I do.

9 Q   All right. The -- Page 111, they write, in the bottom

10 left-hand column, "If all female cases of mesothelioma were

11 unrelated to asbestos exposure -- "

12 A   Yes.

13 Q   " -- our analysis indicates that the lifetime background

14 rate -- risk would be 3.6 times ten to the minus fourth, and

15 the current annual risk would be approximately four per

16 million."

17 A   Yes. Those are two separate statements of fact, but the

18 four per million adjusted risk does not necessarily translate

19 into 3.6 times ten to the minus four lifetime probability.

20 Q   It's -- it -- but there's a mathematical relationship

21 between the two, correct?

22 A   Not an obvious and clear one.

23 Q   Would you agree with me that if the annual risk for

24 mesothelioma is cut in half for all the periods you're

25 interested in, that the lifetime risk would be cut in half as

1 well?

2 A   It depends on what lifetime risk you're looking at. This

3 lifetime risk is for cohorts of women; that is, women born at

4 different periods of time, whereas the incidence rate of

5 mesothelioma is being computed for single periods, or single

6 years. So it's not a clear-cut relationship here. So to try

7 and explain this a little further, what you're interested in is

8 the following. You want to take an individual born at a

9 certain period of time, let's say in the year 2000. You want

10 to follow that individual over his or her entire lifetime. You

11 can decide maybe the lifetime is 75 or 80 years. And you want

12 to compute the probability that that individual would get

13 mesothelioma. That's the lifetime background probability of

14 mesothelioma.

15   On the other hand, if in the year 2000 you look at

16 the incidence rate of mesothelioma in the entire population,

17 you're looking at people of all different ages in the year

18 2000. They're born at different periods of time. They may

19 have different risks of spontaneous mesothelioma, and,

20 therefore, you cannot use this to translate -- it cannot be

21 easily translated one number into another.

22 Q   It can't be easily translated, but would you agree with me

23 generally that if you cut the annual background risk of

24 mesothelioma in half for all the cohorts you studied, it's

25 going to have -- it's going to reduce the lifetime rate?

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1 A   Yes, that I'll grant you.

2 Q   Okay. So it would reduce it somewhat. You just don't

3 know how much.

4 A   Exactly.

5 Q   Okay. Now, would you agree with me, Price and Ware say if

6 all female cases of mesothelioma were unrelated to asbestos

7 exposure, their analysis indicates that the lifetime background

8 risk would be 3.6 times ten to the minus fourth, correct?

9 A   That's correct.

10 Q   All right. If half of the female cases of mesothelioma

11 were asbestos-related, then the lifetime background risk would

12 be half of that, correct?

13 A   Approximately that, yes.

14 Q   Okay. And if three-quarters of the female cases of

15 mesothelioma were related to asbestos, then the lifetime

16 background risk would be one-quarter of 3.6 times ten to the

17 minus fourth?

18 A   Yes, but I should point out that I have made a number of

19 conservative assumptions in this calculation which I would be

20 happy to discuss with you now or take up at redirect.

21 Q   Take them up at redirect, please. Now, you relied on

22 Price and Ware's 2004 paper, correct?

23 A   Yes.

24 Q   Okay. Now, are you aware that Dr. Price -- and this is a

25 paper talking about the incidence of mesothelioma trends in the

1 United States, correct?

2 A   Yes.

3 Q   And in this paper Dr. Price opines that the peak period

4 for mesothelioma in the United States is the 2000/2004 time

5 period, correct?

6 A   I'd like to see that statement.

7 Q   If you look at the graphic, Figure 2 on Page 109.

8 A   Yes.

9 Q   You see that the -- his projected time course of

10 mesothelioma peaks about the year 2000 to 2004 for males?

11 A   Yeah, I can eyeball that. Yes.

12 Q   Okay. So -- and he shows data on the -- I take it you

13 don't dispute -- or you don't dispute one way or the other that

14 the peak period for the mesothelioma incidence in the United

15 States was in the time period 2000/2004?

16 A   No. Thereabouts.

17 Q   Okay. Now, are you aware that Dr. Price wrote a paper on

18 mesothelioma incidence in 1997?

19 A   I have a vague recollection of that.

20 Q   Could you turn to ACC/FCR-2029? This is Dr. Price's 1997

21 analysis of current trends in the United States mesothelioma

22 incidence.

23 A   Yes.

24 Q   And on Page 211 he writes, bottom right-hand, "The results

25 of the analysis show the downward direction of mesothelioma

1 incidence in the United States." See that?

2 A   Yes.

3 Q   And he's got a graphic on Page 213. That graphic plots

4 the mesothelioma incidence in the United States.

5 A   Yes.

6 Q   And so Dr. Price is opining that that incidence of

7 mesothelioma shows a declining trend.

8 A   Well, I don't see any declining trend for males.

9 Q   Not one for females either.

10 A   No, it shows more or less a flat pattern for females.

11 Q   But, for males it's certainly not declining in 1997,

12 correct?

13 A   That's correct.

14 Q   And that didn't cause you to go back and question Dr.

15 Price's work?

16 A   Mr. Finch, this is in The American Journal of

17 Epidemiology, one of the best journals in the world is what you

18 told me just a couple of hours ago. No, I would certainly

19 question his work. I would question his conclusions. And you

20 know that when I was asked in deposition whether I agreed with

21 everything that Dr. Price said, I clearly indicated that there

22 were a couple of paragraphs that I disagreed with strongly.

23 Q   Okay. Let's go back to your calculations. You have --

24   THE COURT: Pardon me. Could you put that exhibit

25 back up please, just the one immediately before, for me? I

1 can't see what the description of the bottom line is, but is it

2 the year?

3   MR. FINCH: The year.

4   THE COURT: Okay. Well, doesn't he say it peaked in

5 2000 to 2004? This ends in 1995.

6   MR. FINCH: My point is in 1997, Your Honor, he said

7 it had peaked before that and that the --

8   THE COURT: I thought you said he said it peaked

9 between 2000 and 2004.

10   MR. FINCH: Let me back up.

11 Q   Dr. Moolgavkar, in the 2004 paper, Dr. Price estimated

12 that mesothelioma incidence in the U.S. peaked in the 2000/2004

13 time frame, right?

14 A   Yes.

15 Q   Okay. And in 1997, he wrote a paper where he said based

16 on data he had since 1992, mesothelioma incidence was

17 declining, right?

18 A   I'd have to go back and read this paper carefully to see

19 exactly what Dr. Price was saying. I can't believe that such

20 an obvious discrepancy between his conclusion and this figure

21 could have passed the referee and the readers of this paper.

22 Q   Okay.

23 A   So, I agree that if I take your statement at face value

24 this figure does not make sense. But, he went back in 2004,

25 did another paper and the details of that appear to be quite

1 correct.

2 Q   Okay. What the 1997 paper -- this is -- we're looking at

3 a 1997 paper. There were two different papers of Price and --

4 A   Right. So I concede the point --

5 Q   -- Price, and this is the 1997 work?

6 A   I concede the point in the '97 paper.

7   MR. FINCH: Okay. May I move on, Your Honor?

8   THE COURT: Yes, sir. I understand now. Thank you.

9 Q   All right. Now, your doubling-dose is 3.2 fiber years,

10 and would you agree with me that under precepts of basic

11 algebra if they're all positive integers, if the -- positive

12 numbers, if you cut the lifetime background risk of

13 mesothelioma in half, it's going to cut your doubling-dose in

14 half?

15 A   Let me point out that you are first of all pointing to

16 only one of my estimates of doubling-dose. This is a

17 doubling-dose that is heavily dominated by chrysotilite fibers,

18 okay. So let me say that first. And then I agree with your

19 algebra. If you cut the background rates by half, the

20 doubling-dose also decreases by half.

21 Q   And -- so that would make your doubling-dose 1.6 fiber

22 years if the background rate was not -- was -- if 50 percent of

23 the mesothelioma in women was attributable to asbestos?

24 A   As I said, it would have to be constant across cohorts.

25 The age-adjusted incidence does not translate readily into

1 lifetime probability.

2 Q   But, if you cut --

3 A   But, I grant you the point. There would be a decrease.

4 Q   And similarly, if you -- if 75 percent of the mesothelioma

5 in women was attributed to asbestos exposure, you would concede

6 that that would lower the lifetime risk from -- excuse me --

7 that would lower your doubling-dose from 3.2 to 0.8, correct?

8 A   Yes.

9 Q   Now, you, in your various reports, reported that the

10 background incidence of mesothelioma was in the range of one

11 case per million per year to four cases per million per year,

12 correct?

13 A   I believe I've said two to four. That's what I currently

14 -- that's the opinion I hold currently.

15 Q   And you recognize that there are researchers in the

16 literature who hold the opinion that the incidence of

17 mesothelioma in those not exposed to asbestos is of the order

18 of one per million per year?

19 A   I'm aware of that, yes.

20 Q   And you're aware that -- were you aware that Julian Peto

21 holds that view?

22 A   No, that I wasn't aware of.

23   MR. FINCH: Could we have ACC/FCR-2085?

24 Q   You would recognize Dr. Peto as an expert in epidemiology,

25 correct?

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1 A   Yeah, definitely.

2 Q   This is an article, Peto, Henderson and Pike, "Trends in

3 Mesothelioma Incidence in the United States," and they write,

4 "The incidence of mesothelioma in those not exposed to asbestos

5 is in the order of one per million per annum."

6   THE COURT: Mr. Finch, you're fading out when you --

7   MR. FINCH: Yes, sure.

8 Q   "The incidence of mesothelioma in those not exposed to

9 asbestos is of the order of one per million per annum." See

10 that?

11 A   Okay. Yeah, I certainly see that, but with all due

12 respect to Mr. -- to Dr. Peto, to Brian Henderson -- you know,

13 the others, Malcolm Pike, these are all epidemiologists who are

14 well known to me -- I would like to know how -- when they wrote

15 this paper. I'm not sure when this paper appeared. When did

16 it appear?

17   UNIDENTIFIED ATTORNEY: Yes. What is the date?

18 Q   I believe the paper appeared in the mid-1980s.

19 A   Okay.

20   UNIDENTIFIED ATTORNEY: 1981 --

21   MS. HARDING: I think that's -- I think it's 1981.

22 A   So, we are going back to 1981 when good registry data was

23 not available, and they probably made a guess like everybody

24 else did, and so I'd like to know how they came up with that

25 figure before I agree with it. I respect all three

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1 individuals, but I'm not sure how they came up with that

2 figure, because they didn't have the data at that time to come

3 up with this.

4 Q   Now, you quote -- in your second report, you have a

5 statement that -- on Page 11 of your second report, "In

6 epidemiologic studies of mesothelioma, at least 20 to 30

7 percent of the cases have no evidence of exposure to asbestos,

8 citing Spertus, et al., 1995." Recall that?

9   THE COURT: Mr. Finch, I'm sorry. You said that so

10 fast I just can't --

11   MR. FINCH: Sorry. I'm sorry, Your Honor.

12   THE COURT: I can't get it when you talk that fast.

13   MR. FINCH: Okay.

14   THE COURT: I'm sorry.

15 Q   On Page 11 of your second -- of your first report, excuse

16 me, first report --

17   THE COURT: What exhibit, please?

18   MR. FINCH: Exhibit 537.

19   THE COURT: Okay.

20 Q   You write, "In epidemiologic studies of mesothelioma, at

21 least 20 to 30 percent of cases have no evidence of exposure to

22 asbestos," and one of the people you cite is a Spertus article

23 from 1995?

24 A   Yes. In fact, Spertus states, as I recall, that between

25 13 percent and a hundred percent of cases report no exposure,

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1 depending on which study you look at.

2 Q   Okay. Could you turn to Exhibit 2057 in your exhibit

3 book?

4 A   Yes.

5 Q   This is the Spertus article you're citing, "Malignant

6 Mesothelioma, Attributable Risks of Asbestos Exposure"?

7 A   Yes.

8 Q   And here they identify potential cases of mesothelioma

9 from the New York State Health Department, and Los Angeles

10 County and the Veterans Administration?

11 A   That's correct.

12 Q   Would you turn to Page 807?

13   UNIDENTIFIED ATTORNEY: What's the number --

14   THE COURT: 2057.

15   UNIDENTIFIED ATTORNEY: Thank you, Your Honor.

16 Q   See Table 2 there --

17 A   Yes.

18 Q   -- Dr. Moolgavkar?

19 A   Yes.

20 Q   All right. Now, cases are the people with mesothelioma

21 and controls are people without mesothelioma, correct?

22 A   That's correct.

23 Q   And the overall reported exposure to asbestos -- the

24 potential reported exposure to asbestos is almost 90 percent,

25 correct?

1 A   In this particular case-control study, yes.

2 Q   Okay. And then --

3 A   But, I might point out to you that in controls, it's just

4 16.9 percent.

5 Q   In -- on Page 809, bottom right paragraph --

6 A   Excuse me. Could we go back to that once again, please?

7   UNIDENTIFIED ATTORNEY: What was the page number?

8   MR. FINCH: I'd like to go to Page 809.

9   THE COURT: No, the witness is asking if he could see

10 the Table 2.

11   MR. FINCH: Oh, the previous page was 807.

12 A   Let's look at that. Frequency and percentage of cases in

13 controls with reported exposure to asbestos, ever exposed to

14 asbestos cases, 129, 62 percent. So I'm not sure where you get

15 your 90 percent from.

16 Q   Would you -- will you agree with me that with the way they

17 did this survey, they first ask the people, were you exposed to

18 asbestos, and then they ask them if they did a series of jobs

19 where there was likely to be exposure to asbestos?

20 A   Yes. So you're combining those two categories.

21 Q   Yes.

22 A   Let's be very clear about that then, that you're looking

23 at not only people who were exposed to asbestos but who think

24 they might have been exposed to asbestos.

25 Q   Would you agree with me that people can be exposed to

1 asbestos and not know it?

2 A   Yes, of course.

3 Q   And --

4   MS. HARDING: Your Honor, I'm just going to object

5 because Mr. Finch represented 90 percent. So it's just unclear

6 on the record what exactly that is.

7   MR. FINCH: It's the number at the bottom that --

8 Q   All right, overall reported exposure to asbestos,

9 potential was almost 90 percent, correct, Dr. Moolgavkar?

10 A   Well, potential is not actual, and those who actually

11 remembered exposure to asbestos, at any time ever exposed to

12 asbestos, is only 62 percent.

13 Q   Okay. But would you agree with me that just because

14 somebody doesn't remember they were exposed to asbestos doesn't

15 mean that they weren't exposed to asbestos?

16 A   No, I agree with you on that, but I will not interpret

17 this 90 percent, as you were trying to suggest, as the number

18 of mesothelioma cases that were exposed to asbestos. That is

19 the wrong interpretation.

20 Q   The authors of this paper reported also, did they not,

21 that over 50 percent of the female cases reported some exposure

22 to asbestos --

23 A   Okay --

24 Q   -- on page 809?

25 A   Yeah. Well, if we cut to the chase here, this is one --

1 this is the only paper that has properly computed or estimated

2 attributable risk, and they conclude that among females, 23

3 percent of pleural and peritoneal mesotheliomas combined are

4 attributable to asbestos exposure.

5 Q   And their 95 percent confidence interval with that was

6 between three and 72 percent, correct?

7 A   Yes, but we take the best value, the maximum likelihood

8 value.

9 Q   Could you turn in your book to ACC-2054? Are you familiar

10 with this paper by Leigh, "Malignant Mesothelioma in

11 Australia"?

12 A   Yes, I am.

13 Q   Here, in the abstract -- excuse me -- in the -- I guess in

14 the abstract, under "Results," they write, "In 88 percent male,

15 90 percent female, 61 percent of cases, a history of asbestos

16 exposure was obtained"?

17 A   Well, the first comment I would like -- yes, that's what

18 they do conclude, but the first comment I would like to make

19 here is that the attributable fraction, or the etiologic

20 fraction or the number of cases attributable to a specific

21 exposure, depends very much on the population that you're

22 studying, and it is well-known that the Australian population

23 is exposed to much more asbestos than the population in

24 America. So you can't translate those results to the United

25 States.

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1 Q   Doesn't this paper also report that even in the group with

2 no known history of exposure 81 percent had fiber counts of

3 asbestos exposure in their lung --

4   THE COURT: Mr. Finch, what's the relevance? Are we

5 going to have claims from Australia?

6   MR. FINCH: No, Your Honor. The point -- the

7 relevance is that people can be -- can be exposed to asbestos

8 and not know it and report that there is no asbestos exposure

9 and that on examination of the tissue in their lungs there is

10 significant excess asbestos fibers.

11 Q   You would agree with that, would you not, Dr. Moolgavkar?

12 A   May I answer that, Your Honor?

13   THE COURT: I hope you would, sir.

14 A   Well, I would agree that you would find asbestos fibers in

15 the lung without any previous history of asbestos exposure in

16 an occupation, but we are all exposed to asbestos in the

17 environment, and in the urban environment there's a lot more

18 asbestos than in the rural environment. I guess if you examine

19 the lungs of anybody in this room today, you'd find asbestos

20 fibers.

21 Q   But you would find --

22 A   So, I'm not sure what you're trying to say.

23 Q   -- far less asbestos -- if asbestos -- if more than --

24 would you -- well, you're not a pathologist are you, Dr.

25 Moolgavkar?

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1 A   I'm not a pathologist. I'm just using my common sense

2 here.

3 Q   You don't have any opinion as to what level of asbestos

4 fibers in the lung indicate an exposure to asbestos well in

5 excess of the background that we all breathe?

6   MS. HARDING: Your Honor, I'm just going to object to

7 the continuing line of questioning. He's not a pathologist.

8 He's -- I don't know why he's asking about fiber burdens in the

9 lung, but --

10   THE COURT: He wants to get into the history of

11 exposure in every country in the world. You know, I don't know

12 what the relevance is, Mr. Finch.

13   MR. FINCH: I'll move on, Your Honor.

14 Q   Dr. Moolgavkar, the other -- back to the slide show. The

15 other factor in your doubling-dose calculation is the potency

16 factor, correct?

17 A   That's the K Sub-M?

18 Q   Yes, K Sub-M --

19 A   That's --

20 Q   -- for mesothelioma.

21 A   That's correct.

22 Q   And in the Redweld in front of you there should be the

23 "1986 Airborne Asbestos Health Assessment Update."

24 A   Yes.

25 Q   And you derive your K Sub-M, your potency factor for the

1 all fibers from that document, correct?

2   THE COURT: What's the exhibit, please?

3   MR. FINCH: It's Exhibit ACC/FCR-298.

4   THE COURT: All right.

5 A   Yes, I believe this is the document, but it's so big I'm

6 going to have -- you know, it's going to take me some time to

7 find it.

8 Q   I might be able to point you to that.

9 A   Because it's the consensus estimate based on all four

10 cohorts that I'm interested in.

11 Q   Okay. There are -- Page 90, those are the four cohorts

12 from which the various K Sub-M is calculated.

13 A   Okay. Are you saying that it's not ten to the minus

14 eight, is that what you're saying?

15 Q   No, I agree with you it's ten to the minus eight.

16 A   Okay --

17 Q   But there were four -- and as you put on one of your

18 slides in direct, there were four cohort studies that the EPA

19 relied on to estimate the risk of mesothelioma, correct?

20 A   Correct.

21 Q   For the mesothelioma, and --

22 A   Yes.

23 Q   -- would you agree with me that on Page 3-30 that lists

24 those four cohort studies and an estimated K Sub-M for each of

25 them?

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1 A   Yes.

2 Q   Okay. So, you've got the insulation workers for Selikoff,

3 et al. There the K Sub-M is 1.5 times ten to the minus eight?

4 A   Yes.

5 Q   Okay. And would you agree with me as a matter of

6 mathematics, if you increase the K Sub-M, you decrease the

7 doubling-dose?

8 A   Well, I know exactly where you're going with this, Mr.

9 Finch. You can take this range of K Sub-M values and you would

10 get different estimates of doubling-dose. I agree with that

11 completely. All I'm saying is that I took the one single

12 consensus estimate presented in this document, which according

13 --

14 Q   Okay --

15 A   -- which in Nicholson's judgment was the best estimate.

16 Q   Okay. And the consensus was one times ten to the minus

17 eight, which happens to be the same K Sub-M for the textile

18 workers, and that refers to a Peto 1980?

19 A   Yes.

20 Q   All right. That's the textile products manufacturer in

21 Rochedale, England?

22 A   Yes.

23 Q   Would you turn to Page 56?

24 A   Yes.

25 Q   This is a textile products manufacturing, Rochedale -- go

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1 to the bottom of the page, John -- textile products

2 manufacturing, Rochedale, England, and this is the Peto study

3 they're talking about?

4 A   Yes.

5 Q   And they classify this as chrysotile?

6 A   Well, it's not chrysotile. We know that.

7 Q   We know that 97 percent of their fiber was chrysotile.

8 A   Well, we know that given the different potencies of the

9 amphibole and the chrysotile, it's not correct to call this a

10 chrysotile cohort, and you know --

11 Q   Well, the --

12 A   -- you know, Mr. Finch, that in Hodgson & Darnton this is

13 not called a chrysotile cohort, and --

14 Q   In --

15 A   So to pull up this old reference and call it a chrysotile

16 cohort I think is unfair.

17 Q   Well, in any event, the EPA -- vast majority of the fiber

18 was chrysotile, correct?

19 A   That's why I called it a mixed fiber estimate.

20 Q   Okay. So it's a mixed fiber estimate. Don't they also

21 say that before 1951 there's no measurements of dust

22 concentration?

23 A   Yes. If you're getting back into exposure issues, what I

24 said in my direct was that the exposure of information, if it

25 was good enough for the EPA, if it was good enough for Berman

1 and Crump and if it was good enough for Hodgson & Darnton, it's

2 good enough for me to draw my conclusions.

3 Q   Okay. On Page 95 doesn't the -- Page 95 of the EPA

4 document, bottom of the page, the EPA talks about the 95

5 percent confidence limits on the estimated value of K Sub-L and

6 K Sub-M?

7 A   Yes.

8   UNIDENTIFIED ATTORNEY: What exhibit are we --

9   MR. FINCH: The same exhibit. The same -- it's the

10 -- 298.

11   UNIDENTIFIED ATTORNEY: Page 95?

12 Q   Page 95, bottom right-hand corner. EPA writes, "While it

13 is not possible to estimate the 95 percent confidence limit

14 directly, a factor of five would appear to be reasonable for

15 the average value of K Sub-M and a factor of 20 on its

16 application to any unknown exposure circumstance." Do you see

17 that?

18 A   Yes, and I agree that there are a great many uncertainties

19 in the estimates that I've presented here. What I have tried

20 to do is present the best estimate based on what's called the

21 central, or the best estimate of the parameters available in

22 the literature, and I'm willing to concede that there are a

23 great many uncertainties that illustrates the point that I'm

24 trying to make, that we know very little about what is going on

25 in the low dose region, 15 fibers per mil years.